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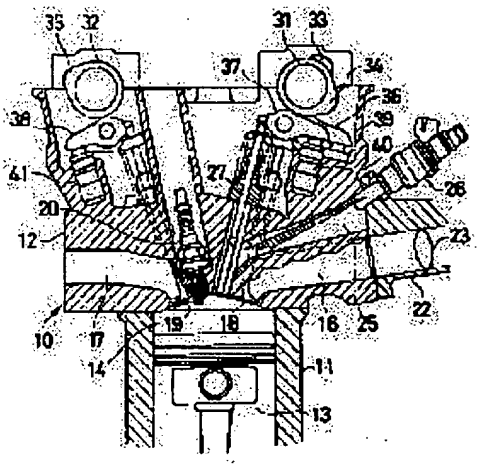
(54) INTAKE DEVICE FOR ENGINE



(57)Abstract:
PURPOSE: To enhance lamination combustion and improve power consumption and emission while simplifying the structure without requiring a pressurized air supplying means to an air-fuel mixture feed port.
CONSTITUTION: A swirl is generated in a combustion chamber 14 by the intake air from an intake port 16, and an air-fuel mixture feed port 25 is opened to the combustion chamber in a position close to an ignition plug about in the center part of a cylinder bore. A center valve 27 for opening and closing the air-fuel mixture feed port 25 is opened in the latter half of intake stroke, and the closing time of the center valve 27 is set to the latter stage of compression stroke, whereby the air in the combustion chamber is guided into the air-fuel mixture feed port in the latter period of compression stroke.

CLAIMS

[Claim(s)]
[Claim 1] It has a supply port. the gaseous mixture which supplies the gaseous mixture of a pressurization condition to a combustion chamber apart from a suction port -- A combustion chamber is made to carry out opening of the supply port in the location near the ignition plug in the abbreviation core of a cylinder bore. this gaseous mixture -- And while setting up the direction of opening in the direction of an abbreviation cylinder axis and making it make a combustion chamber generate a swirl by the inhalation of air from a suction port In the suction system of the engine with which made it an inhalation-of-air line make the closing motion valve which opens and closes a supply port open in the second half the above -- gaseous mixture -- the above -- gaseous mixture -- the gaseous mixture make a supply port into a saccate closed space, and according to the above-mentioned closing motion valve -- the closed stage of a supply port by setting it as the anaphase of the anaphases the early stages of a compression stroke, and the middle the above -- gaseous mixture -- the opening period of a supply port -- setting -- the -- on the way -- the period by the stage -- gaseous mixture -- while gaseous mixture blows off from a supply port to a combustion chamber -- a compression stroke anaphase -- the air of a combustion chamber -- gaseous mixture -- the suction system of the engine characterized by constituting so that it may be introduced into a supply port.
[Claim 2] the above -- gaseous mixture -- the suction system of the engine according to claim 1 characterized by setting the path of opening of a supply port as 1/15 or more range or less [of the diameter of a cylinder bore] by 1/10.
[Claim 3] the above to a combustion chamber -- gaseous mixture -- the suction system of the engine according to claim 2 characterized by setting the opening area of a supply port or less [of the total opening area of a suction port] to 1/5.
[Claim 4] the above -- gaseous mixture -- the average Mach multiplier in the throat section becomes about 0.4 about a supply port -- as -- setting up -- the above -- gaseous mixture -- the gaseous mixture from a supply port to a combustion chamber -- the amount of flush carries out a choke -- as -- the above -- gaseous mixture -- the suction system of the engine according to claim 1 to 3 characterized by setting up a supply-port close stage.
[Claim 5] the above -- gaseous mixture -- the suction system of the engine according to claim 1 to 4 characterized by setting a supply-port close stage as the range of 120-140deg behind a bottom dead point by the crank angle.
[Claim 6] the above -- gaseous mixture -- the gaseous mixture at the time in front of a supply-port open stage -- the suction system of the engine according to claim 1 to 5 characterized by setting the differential pressure of the pressure in a supply port, and the pressure of a combustion chamber as the range of 0.3-2.0kg/cm2.
[Claim 7] rotation of a cam shaft -- the above -- gaseous mixture -- the suction system of the engine according to claim 1 to 6 characterized by having had the valve gear which opens and closes the closing motion valve of a supply port, and building a hydraulic rushes adjuster into this valve gear.
[Claim 8] the above -- gaseous mixture -- the suction system of the engine according to claim 1 to 7 characterized by constituting so that closing motion actuation may be carried out to fixed closing motion timing by the valve gear using the inlet valve which opens and closes a suction port for the closing motion valve of a supply port, and a common cam shaft.
[Claim 9] the above -- gaseous mixture -- the suction system of the engine according to claim 1 to 7 characterized by to establish a valve timing adjustable means to change the closing motion

timing of the above-mentioned closing motion valve and the above-mentioned exhaust valve by changing the phase of rotation of the cam shaft to a crankshaft into this valve gear while constituting so that closing motion actuation of the closing motion valve of a supply port might be carried out by the valve gear using the exhaust valve which opens and closes an exhaust air port, and a common cam shaft.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] gaseous mixture for the usual suction port to form gaseous mixture by mixing with pressurization air and a fuel, and for this invention supply it to a combustion chamber independently, -- it is related with the suction system of the engine equipped with the supply port.
[0002]
[Description of the Prior Art] Conventionally, as a means to make stratification combustion effective for a fuel consumption improvement etc. perform good, while arranging a suction port so that a swirl may be generated to a combustion chamber at the time of a low load etc. as shown in JP,5-202753,A A supply port is prepared. the gaseous mixture which carries out opening to a combustion chamber apart from this suction port in the location near the ignition plug in the abbreviation core of a cylinder bore -- this gaseous mixture -- the period ranging from [by the closing motion valve / in an inhalation-of-air line] the telophase to the early stages of a compression stroke for a supply port -- opening -- making -- this gaseous mixture -- the suction system which established a pressurization air supply means to supply pressurization air is known to the supply port from the injector which supplies a fuel, and the exterior. according to this suction system -- like an inhalation-of-air line -- the period in early stages of [a telophase to] a compression stroke -- gaseous mixture -- pressurization air and a fuel are mixed in a supply port -- having -- that pressurization -- gaseous mixture -- like an inhalation-of-air line -- the period in early stages of [a telophase to] a compression stroke -- gaseous mixture -- it spouts from a supply port to a combustion chamber. Thereby, while evaporation and atomization of a fuel are promoted, gaseous mixture is stratification-ized near the ignition plug of a way among swirls, and stratification combustion is performed good. For this reason, while Lean-ization with a large air-fuel ratio is attained, flammability improves, and fuel consumption and emission are improved.
[0003]
[Problem(s) to be Solved by the Invention] as mentioned above, gaseous mixture -- the inside of a supply port is pressurized and gaseous mixture is blown off to a combustion chamber to the above predetermined timing -- it should make -- gaseous mixture -- what supplied pressurization air to the supply port from the exterior -- an air pump and pressurization air supply -- the path [like] etc. was needed and the problem that structure became complicated was left behind.
[0004] such [this invention] a situation -- taking an example -- gaseous mixture -- it aims at offering the suction system of the engine which can improve fuel consumption and emission, not needing a pressurization air supply means to a supply port, but simplifying structure.
[0005]
[Means for Solving the Problem] As above-mentioned The means for solving a technical

problem, this invention It has a supply port. the gaseous mixture which supplies the gaseous mixture of a pressurization condition to a combustion chamber apart from a suction port -- A combustion chamber is made to carry out opening of the supply port in the location near the ignition plug in the abbreviation core of a cylinder bore. this gaseous mixture -- And while setting up the direction of opening in the direction of an abbreviation cylinder axis and making it make a combustion chamber generate a swirl by the inhalation of air from a suction port In the suction system of the engine with which made it an inhalation-of-air line make the closing motion valve which opens and closes a supply port open in the second half the above -- gaseous mixture -- the above -- gaseous mixture -- the gaseous mixture make a supply port into a saccate closed space, and according to the above-mentioned closing motion valve -- the closed stage of a supply port by setting it as the anaphase of the anaphases the early stages of a compression stroke, and the middle the above -- gaseous mixture -- the opening period of a supply port -- setting -- the -- on the way -- the period by the stage -- gaseous mixture -- while gaseous mixture blows off from a supply port to a combustion chamber -- a compression stroke anaphase -- the air of a combustion chamber -- gaseous mixture -- it constitutes so that it may be introduced into a supply port (claim 1).

[0006] this invention -- setting -- the above -- gaseous mixture -- it is desirable to set the path of opening of a supply port as 1/15 or more range or less [of the diameter of a cylinder bore] by 1/10 (claim 2).

[0007] moreover, the above to a combustion chamber -- gaseous mixture -- it is desirable to set the opening area of a supply port or less [of the total opening area of a suction port] to 1/5 (claim 3).

[0008] moreover, the above -- gaseous mixture -- the average Mach multiplier in the throat section becomes about 0.4 about a supply port -- as -- setting up -- the above -- gaseous mixture -- the gaseous mixture from a supply port to a combustion chamber -- the amount of flush carries out a choke -- as -- the above -- gaseous mixture -- it is effective to set up a supply-port close stage (claim 4).

[0009] concrete -- the above -- gaseous mixture -- a supply-port close stage is set as the range of 120-140deg behind a bottom dead point by the crank angle (claim 5).

[0010] moreover, the above -- gaseous mixture -- the gaseous mixture at the time in front of a supply-port open stage -- the differential pressure of the pressure in a supply port and the pressure of a combustion chamber is set as the range of 0.3-2.0kg/cm2 (claim 6).

[0011] as the device which operates the above-mentioned closing motion valve -- rotation of a cam shaft -- the above -- gaseous mixture -- it is desirable to have the valve gear which opens and closes the closing motion valve of a supply port, and to build a hydraulic rushes adjuster into this valve gear (claim 7).

[0012] moreover, the above -- gaseous mixture -- it is effective to constitute the closing motion valve of a supply port by the valve gear using the inlet valve which opens and closes a suction port, and a common cam shaft, so that closing motion actuation may be carried out to fixed closing motion timing (claim 8).

[0013] or the above -- gaseous mixture -- while constituting so that closing motion actuation of the closing motion valve of a supply port may be carried out by the valve gear using the exhaust valve which opens and closes an exhaust air port, and a common cam shaft, it is also effective by changing the phase of rotation of the cam shaft to a crankshaft into this valve gear to establish a valve timing adjustable means to change the closing motion timing of the above-mentioned closing motion valve and the above-mentioned exhaust valve (claim 9).

[0014]
[Function] according to equipment according to claim 1 -- the above -- gaseous mixture -- the opening period of a supply port -- on the way -- the period by the stage -- gaseous mixture -- the gaseous mixture pressurized from the supply port blows off, and by supplying this gaseous mixture to the circumference of the ignition plug of a way among the swirls of a combustion chamber, while evaporation and atomization of a fuel are promoted, stratification-ization of gaseous mixture is performed good. and the above -- gaseous mixture -- trying to incorporate high-pressure air required for jet from the combustion chamber of a compression stroke anaphase -- gaseous mixture -- a pump, piping, etc. for the pressurization air supply to a supply port are not needed, but structure is simplified.
[0015] this invention -- setting -- being according to claim 2 -- like -- gaseous mixture -- the gaseous mixture for performing good stratification-ization by setting up the path of opening of a supply port -- it becomes advantageous to reservation of the jet rate of flow and a flow rate.
[0016] moreover -- being according to claim 3 -- like -- gaseous mixture -- while suction-port opening area is secured by setting up the ratio of the opening area of a supply port, and the total opening area of a suction port -- gaseous mixture -- jet of the gaseous mixture from a supply port is performed effectively.
[0017] moreover, the above -- gaseous mixture -- the gaseous mixture from a supply port to a combustion chamber -- setting up so that it may become about 0.4 average Mach multiplier of the jet rate of flow -- (claim 4) and gaseous mixture -- the jet rate of flow is raised and stratification-ization is performed good.
[0018] concrete -- the above -- gaseous mixture -- a supply-port close stage -- a crank angle -- after a bottom dead point -- the range of 120-140deg -- setting up (claim 5) -- gaseous mixture -- the gaseous mixture at the time in front of a supply-port open stage -- what (claim 6) the differential pressure of the pressure in a supply port and the pressure of a combustion chamber is set as the range of 0.3-2.0kg/cm2 for -- above -- gaseous mixture -- the injection rate of flow is raised and stratification-ization is performed good.
[0019] gaseous mixture -- if a hydraulic rushes adjuster is built into the valve gear which opens and closes the closing motion valve of a supply port (claim 7), a gap will be prevented at the closed stage of a pin center,large valve -- a compression stroke anaphase -- setting -- gaseous mixture -- it is avoided that gross errors arise in the pressure of the air incorporated in a supply port and the amount of air installation.
[0020] a valve gear will be simplified, if a valve gear is constituted so that closing motion actuation of the above-mentioned closing motion valve may be carried out by the inlet valve and the common cam shaft (claim 8) -- having -- and gaseous mixture -- the amount of [to a supply port] fuel feed zone keeps away from an exhaust air port, and heat damage is prevented.
[0021] If a valve timing adjustable means to change the phase of rotation of this cam shaft is established while constituting so that closing motion actuation of the above-mentioned closing motion valve may be carried out by the exhaust valve and the common cam shaft (claim 9), it will become possible to change according to operational status so that a demand may be suited with one valve timing adjustable means, respectively in each closing motion timing of the above-mentioned closing motion valve and an exhaust valve.
[0022]
[Example] The example of this invention is explained based on a drawing.
[0023] In drawing 1 , an engine 10 consists of a cylinder block 11 and cylinder head 12 grade, it has two or more cylinders, a piston 13 is contained possible [rise and fall] in each of that

cylinder, and the combustion chamber 14 is formed in the upper part. Into this combustion chamber 14, the 1st suction port 15, the 2nd suction port 16, and two exhaust air ports 17 are carrying out opening. As shown in drawing 2 , both the above-mentioned suction ports 15 and 16 are allotted to one side (2 drawing 1 , right-hand side) bordering on the core of a combustion chamber 14, both the above-mentioned exhaust air port 17 is allotted by the another side side (2 drawing 1 , left-hand side), and the ignition plug 20 is arranged in the abbreviation core of a cylinder bore at it. Both the suction ports 15 and 16 are opened and closed by actuation of an inlet valve 18, respectively, and both the exhaust air port 17 is opened and closed by actuation of an exhaust valve 19, respectively.

[0024] The 1st inlet pipe 21 and the 2nd inlet pipe 22 which were prepared in the inlet manifold are connected to the 1st suction port 15 of the above, and the 2nd suction port 16, respectively. The swirl control valve 23 is formed in the 2nd inlet pipe 22 which leads to the 2nd suction port 16 of the above, or this, and this swirl control 23 operates according to operational status with the actuator outside drawing, is closed in a low rotation region, and is opened in a high rotation region. Incidence of the 1st suction port 15 of the above is carried out to the combustion chamber 14 from the horizontally near direction rather than the 2nd suction port 16, and after the above-mentioned swirl control valve 23 has closed, a swirl (horizontal swirl) is generated in a combustion chamber 14 by the inhalation of air from the 1st suction port 15.

[0025] moreover, gaseous mixture with the another above-mentioned suction ports 15 and 16 -- the supply port 25 is carrying out opening to the boa core near the above-mentioned ignition plug 20, and the direction of opening is set up in the direction of an abbreviation cylinder axis (drawing the vertical direction). this gaseous mixture -- let a supply port 25 be a saccate closed space by blockading the edge of the opposite side with the side which carries out opening to a combustion chamber 14 -- having -- **** -- this gaseous mixture -- a fuel is injected from an injector 26 inside a supply port 25. gaseous mixture -- a supply port 25 is opened and closed by actuation of the pin center,large valve (closing motion valve) 27. and it explains in full detail behind -- as -- during the valve-opening period of the pin center,large valve 27 -- gaseous mixture -- the closing motion timing of the pin center,large valve 27 is set up so that jet of the gaseous mixture from a supply port 25 to a combustion chamber 14 and incorporation of the air of the combustion chamber of a compression stroke anaphase may be performed.

[0026] the above -- gaseous mixture -- the path (diameter of a throat) Dm of opening of a supply port 25 is set as 1/15 or more range or less [of the diameter Ds of a cylinder bore] by 1/10. moreover, gaseous mixture -- gaseous mixture [as opposed to a combustion chamber 14 as a dimension ratio of opening of a supply port 25, and opening of suction ports 15 and 16] -- the opening area Sm of a supply port 25 is set or less [which doubled the opening area Sa and Sb of both the suction ports 15 and 16 / of the suction-port total opening area] to 1/5.

[0027] Synchronizing with rotation of a crankshaft, closing motion actuation of the above-mentioned pin center,large valve 27, an inlet valve 18, and the exhaust valve 19 is carried out by the valve gear which consists of a cam shaft etc. In this example, the above-mentioned pin center,large valve 27 operates by the inlet valve 18 and the common cam shaft 31. That is, the cam shafts 31 and 32 of a pair are arranged on the cylinder head, the cam 33 for inlet valves and the cam 34 for pin center,large valves are formed in the cam shaft [on the other hand / (it is right-hand side at drawing 1)] 31, and the cam 35 for exhaust valves is formed in the cam shaft 32 of another side (it is left-hand side at drawing 1). And an inlet valve 18 and the pin center,large valve 27 operate through the rocker arm 36 for inlet valves of a swing-arm type, and the rocker arm 37 for pin center,large valves, respectively by above-mentioned one cam shaft 31,

and an exhaust valve 19 operates through the rocker arm 38 for exhaust valves by the cam shaft 32 of above-mentioned another side.
[0028] HLAs (hydraulic rushes adjuster) 39, 40, and 41 which adjust valve clearance to zero automatically are formed in the pivot part of each above-mentioned rocker arms 36-38.
[0029] Drawing 3 shows the valve timing of the above-mentioned inlet valve 18 and the pin center,large valve 27. Like illustration, the valve-opening period of an inlet valve 18 is carried out immediately after [piston top dead center this side to] the piston bottom dead point. On the other hand, the pin center,large valve 27 is opened from the second half (this side of a bottom dead point) like an inhalation-of-air line. And the closed stage of the pin center,large valve 27 is carried out within the period of the anaphase (this side of a compression top dead center), if a compression stroke is equally divided into three the first stage and the middle at an anaphase. thereby -- the first half side of the valve-opening period (gaseous mixture opening period of a supply port) of the pin center,large valve 27 -- gaseous mixture -- gaseous mixture blows off from a supply port 25 to a combustion chamber 14 -- having -- a second half side -- the high-pressure air of the combustion chamber of a compression stroke anaphase -- gaseous mixture -- it is introduced into a supply port 25.
[0030] Specifically, the closed stage of the above-mentioned pin center,large valve 27 is 120-140deg behind a bottom dead point at a crank angle. It is set as the range. a setup of a such pin center,large valve-closing time term, and the above gaseous mixture -- the gaseous mixture [setup / of the path of opening of a supply port 25 area, etc.] at the time in front of a pin center,large valve-opening stage -- the differential pressure of the pressure in a supply port 25, and the pressure in a combustion chamber 14 -- 0.3-2.0kg/cm2 the range -- becoming -- gaseous mixture -- a supply port 25 is constituted so that it may become about 0.4 average Mach multiplier in the throat section -- having -- gaseous mixture -- the gaseous mixture from a supply port 25 to a combustion chamber 14 -- the choke of the amount of flush is carried out.
[0031] Next, an operation of this suction system is explained.
[0032] In a low-speed low load field at least, clausilium of the above-mentioned swirl control valve 23 is carried out, inhalation of air is made only from the 1st suction port 15, and a swirl flow produces an inhalation-of-air line in a combustion chamber 14 by this inhalation of air at the period ranging from the second half to a compression stroke.
[0033] on the other hand -- gaseous mixture -- in a supply port 25, a fuel is injected from an injector 26 by the air pressed fit from the combustion chamber 14 by the compression stroke of a front cycle, and gaseous mixture is formed in it. and the beginning when the pin center,large valve 27 was opened for the inhalation-of-air line in the second half -- gaseous mixture -- the differential pressure of the pressure in a supply port 25, and the pressure in a combustion chamber 14 -- the above -- gaseous mixture -- gaseous mixture -- it blows off from a supply port 25 in a combustion chamber 14. then -- if a compression stroke advances and the pressure in a combustion chamber 14 rises -- the air in it -- reverse -- gaseous mixture -- it is pushed in in a supply port 25, and it is shut up when the pin center,large valve 27 closes the valve. the pin center,large valve 27 is closed especially at the anaphase of a compression stroke -- gaseous mixture -- the pressure in a supply port 25 fully raises -- having -- this pressure -- degree cycle -- gaseous mixture -- it becomes the pressure which makes gaseous mixture blow off from a supply port 25.
[0034] gaseous mixture -- the gaseous mixture which blew off from the supply port 25 is supplied to a way among the swirls generated in the combustion chamber 14, it is stratification-ized so that it may be unevenly distributed in the surroundings of the ignition plug 26 of a boa

core, and combustion is performed good.
[0035] thus, the gaseous mixture which carries out opening to the abbreviation core of a cylinder bore after the second half like an inhalation-of-air line -- the gaseous mixture pressurized from the supply port 25 supplies -- having -- the gaseous mixture -- while evaporation and atomization of a fuel are promoted in the case of jet, Lean-ization with a large air-fuel ratio is attained by performing stratification-ization of gaseous mixture good.
[0036] such gaseous mixture -- in order to make it supply good -- the above -- gaseous mixture -- as for the path Dm of opening of a supply port 25, it is desirable to consider as 1/10 or less [of the diameter of a cylinder bore] and 1/15 or more range. the above -- gaseous mixture -- if the path of opening of a supply port 25 becomes larger than the above-mentioned range -- distribution and gaseous mixture of a fuel -- stratification-ization spoils by the fall of the injection rate of flow -- having -- being easy -- if it becomes smaller than the above-mentioned range -- required gaseous mixture -- it is because reservation of the amount of supply becomes difficult. moreover, gaseous mixture -- the gaseous mixture from a supply port 25 -- gaseous mixture [as opposed to / while raising the injection rate of flow, in order to secure a required opening area of suction ports 15 and 16 / a combustion chamber 14] -- as for the opening area of a supply port 25, it is desirable that it is 1/5 or less [of the suction-port total opening area].
[0037] and -- such -- gaseous mixture -- the magnitude of opening of a supply port 25 -- setting up -- gaseous mixture, while making it the average Mach multiplier in the throat section of a supply port 25 become about 0.4 It is 120-140deg behind a bottom dead point at a crank angle about the closed stage of the above-mentioned pin center,large valve 27. If it is set as the range gaseous mixture -- the differential pressure of the pressure in a supply port 25, and the pressure in a combustion chamber 14 -- 0.3-2.0kg/cm2 the range -- becoming -- gaseous mixture -- the gaseous mixture from a supply port 25 to a combustion chamber 14 -- the amount of flush -- a choke -- carrying out -- gaseous mixture -- the jet rate of flow is fully raised. thereby -- gaseous mixture -- evaporation and atomization of the fuel in the case of jet are fully promoted, and stratification-ization of gaseous mixture is performed effectively.
[0038] The result of the experiment about the flammability which this invention person performed is shown in drawing 4 - drawing 7 about this example and the example of a comparison. In addition, 78mm of diameters of a boa and a piston-stroke 83.6mm engine are used for the experimental result shown in these drawings. It deg(s). the case of the example of this invention -- gaseous mixture -- the open stage ATDC130 of a supply port -- the close period -- ABDC130deg It deg(s). ** -- the case of the example of a comparison which carries out and supplies pressurization air from the exterior -- gaseous mixture -- the open stage ATDC130 of a supply port -- It is ABDC90deg about the close period. It carries out and experiments under fixed operational status (N=1500rpm, BMEP=0.29MPa).
[0039] drawing 4 -- combustion chamber internal pressure and the gaseous mixture in front of a pin center,large valve-opening valve -- the gaseous mixture at the time of supplying pressurization air from the exterior so that the pressure in a supply port may serve as 50kPa(s) -- supply-port internal pressure and the combustion chamber air of a compression stroke anaphase -- gaseous mixture -- the gaseous mixture in the case of being based on the example of this invention incorporated to the supply port -- supply-port internal pressure -- like an inhalation-of-air line -- from -- it is shown covering the compression stroke. the case where it is based on the example of this invention as shown in this drawing -- a compression stroke anaphase -- gaseous mixture -- like the inhalation-of-air line by which a pin center,large valve is opened by heightening supply-port internal pressure and maintaining that pressure during the clausilium

period of a pin center,large valve -- the second half -- combustion chamber internal pressure -- gaseous mixture -- supply-port internal pressure -- enough -- high -- becoming -- gaseous mixture -- differential pressure required for jet is obtained.

[0040] When drawing 5 formed the injector in the suction port and fuel injection is performed, the pressurization air supply from the outside -- the gaseous mixture in front of a pin center,large valve-opening valve -- after setting the pressure in a supply port to 50kPa(s) -- gaseous mixture -- the gaseous mixture from a supply port -- with the case where it injects the combustion chamber air of a compression stroke anaphase -- gaseous mixture -- a supply port -- incorporating -- making -- gaseous mixture -- the gaseous mixture from a supply port -- the combustion period to the mean-effective-pressure fluctuation in various air-fuel ratios and 90% of mass fuel rates is shown about the case where it is based on the example of this invention which injected, respectively. Moreover, drawing 6 shows the specific fuel consumption in various air-fuel ratios, HC discharge, and the NOx discharge about each above-mentioned ****, respectively.

[0041] In the port injection which injects a fuel to a suction port, as shown in drawing 5 , while a combustion period becomes long as an air-fuel ratio becomes large, if an air-fuel ratio becomes about 25, mean-effective-pressure fluctuation will increase rapidly and an air-fuel ratio of this level will serve as the combustion stability limit (Lean limitation). on the other hand, gaseous mixture -- the gaseous mixture from a supply port -- when based on injection, compared with the above-mentioned port injection, a combustion period is short and rapid to a quite bigger air-fuel ratio than the air-fuel ratio of the combustion stability limit in the case of being port injection and the stable combustion condition are acquired. that is, gaseous mixture -- the gaseous mixture from a supply port -- the flammability in the Lean condition improves and the Lean limitation is sharply raised by the stratification combustion by injection.

[0042] moreover -- although fuel consumption and HC increase rapidly according to aggravation inflammable with the air-fuel ratio near [the] the combustion stability limit (A/F=25) according to the above-mentioned port injection as shown in drawing 6 -- gaseous mixture -- the gaseous mixture from a supply port -- when based on injection, fuel consumption is reduced to a bigger air-fuel ratio (about 35), and the increment in HC is controlled. moreover, gaseous mixture -- the gaseous mixture from a supply port -- although an NOx discharge serves as max in the air-fuel ratio 18 neighborhood and reduction of the NOx discharge by the side of Lean becomes loose compared with the case of port injection from this since the flammability in the Lean field is raised when based on injection, an NOx discharge is fully controlled by enlarging an air-fuel ratio.

[0043] thus -- while supplying pressurization air from the case where it is based on the example of this invention, or the exterior -- gaseous mixture -- the gaseous mixture from a supply port -- when it injects, the Lean limitation is raised and the flammability in the Lean field, fuel consumption, and emission improve.

[0044] and -- this invention -- the above -- gaseous mixture -- since he is trying to incorporate high-pressure air required for jet out of the combustion chamber 14 of a compression stroke anaphase -- gaseous mixture -- a pump, piping, etc. for the pressurization air supply to a supply port are not needed, but good stratification combustion can be performed with easy structure.

[0045] in addition -- the above-mentioned example -- gaseous mixture -- gaseous mixture [in / by forming HLA40 in the valve gear which drives the pin center,large valve 27 of a supply port 25 / a compression stroke anaphase] -- air installation to a supply port 25 is performed with a sufficient precision. that is, -- since the pressure in a combustion chamber 14 changes rapidly at a

compression stroke anaphase, if a gap arises at the closed stage of the pin center,large valve 27 -- gaseous mixture -- although the amount of air installation to a supply port 25 changes a lot, if HLA40 is formed, a gap of the closed stage of the pin center,large valve 27 will prevent -- having -- gaseous mixture -- it is avoided that gross errors arise in the amount of air installation to a supply port 25.

[0046] moreover, gaseous mixture -- when the pin center,large valve 27 of a supply port 25 operates by the inlet valve 18 which opens and closes suction ports 15 and 16, and the common cam shaft 31, a valve gear is simplified compared with a case so that the cam shaft for pin center,large valve actions may be prepared separately -- having -- and gaseous mixture -- since a supply port 25 and an injector 27 keep away from the exhaust air port 17, heat damage is prevented certainly.

[0047] Drawing 7 shows another example of this invention. this example -- suction ports 15 and 16, the exhaust air port 17, and gaseous mixture -- although the configuration of supply-port 25 grade is the same as that of the example shown in drawing 1 -- the above -- gaseous mixture -- while the pin center,large valve 27 of a supply port 25 operates by the valve gear using an exhaust valve 19 and the common cam shaft 52, the valve timing adjustable means 60 is formed in this valve gear.

[0048] That is, the cam shafts 51 and 52 of a pair are arranged on the cylinder head 12, the cam 53 for inlet valves is formed in the cam shaft 51 of one of these, and the cam 54 for pin center,large valves and the cam 55 for exhaust valves are formed in the cam shaft 52 of another side. And while an inlet valve 18 operates through the rocker arm 56 for inlet valves by above-mentioned one cam shaft 51, the pin center,large valve 27 and an exhaust valve 19 operate through the rocker arm 57 for pin center,large valves, and the rocker arm 58 for exhaust valves by the cam shaft 52 of above-mentioned another side.

[0049] Moreover, the above-mentioned valve timing adjustable means 60 changes the closing motion timing of the above-mentioned pin center,large valve 27 and an exhaust valve 19 by changing the phase of rotation of the cam shaft 52 to a crankshaft. And by controlling the above-mentioned valve timing adjustable means 60 according to operational status, the closing motion timing of the above-mentioned pin center,large valve 27 and an exhaust valve 19 is changed like the two-dot chain line in drawing 8 at the time of the continuous line in drawing 8 , and a low speed at the time of a low speed, that is, closing motion timing is brought forward rather than the time of a low speed at the time of a high speed.

[0050] According to this example, according to operational status, it can change so that a demand may be suited with one valve timing adjustable means 60, respectively in each closing motion timing of the pin center,large valve 27 and an exhaust valve 19. that is, -- the time of the high-speed heavy load which needs high power -- gaseous mixture -- it is desirable to bring forward the closing motion timing of the pin center,large valve 27 in order to weaken stratification-ization of the gaseous mixture which blows off from a supply port 25 and to distribute gaseous mixture. Moreover, in order to reduce the pumping loss like the exhaust air line at the time of a high speed, as for the closing motion timing of an exhaust valve 19, it is desirable to bring forward at the time of a high speed. Thus, since what is necessary is just to bring closing motion timing forward at the time of a high speed, both the pin center,large valve 27 and the exhaust valve 19 can control closing motion timing of these valves 19 and 27 appropriately with easy structure by establishing the valve timing adjustable means 60 to this cam shaft 55, as these valves 19 and 27 are operated by the common cam shaft 55.

[0051]

[Effect of the Invention] the gaseous mixture which carries out opening of this invention near the ignition plug in the abbreviation core of a cylinder bore as mentioned above -- while making a supply port into a saccate closed space -- gaseous mixture -- since the closed stage of a supply port is set as the anaphase of a compression stroke -- gaseous mixture -- the opening period of a supply port -- on the way -- the period by the stage -- gaseous mixture -- gaseous mixture can be made to be able to blow off from a supply port, gaseous mixture can be stratification-ized, and the flammability in the Lean condition can be improved. and the above -- gaseous mixture -- high-pressure air required for jet -- from the combustion chamber of a compression stroke anaphase -- it can incorporate -- gaseous mixture -- a pump, piping, etc. for the pressurization air supply to a supply port are not needed, but structure can be simplified.

[0052] especially -- gaseous mixture -- the above of as opposed to [set the path of opening of a supply port as 1/15 or more range or less / of the diameter of a cylinder bore / by 1/10, and] a combustion chamber -- gaseous mixture -- the gaseous mixture by the pressure of the air incorporated from the combustion chamber of a compression stroke anaphase when setting the opening area of a supply port or less [of the total opening area of a suction port] to 1/5 -- the gaseous mixture from a supply port can be made to inject effectively

[0053] moreover, the above -- gaseous mixture, while setting up a supply port so that the average Mach multiplier in the throat section may become about 0.4 A supply-port close stage is set up. gaseous mixture -- the gaseous mixture from a supply port to a combustion chamber -- the amount of flush carries out a choke -- as -- gaseous mixture -- specifically the above -- gaseous mixture -- a supply-port close stage -- a crank angle -- after a bottom dead point -- 120-140deg setting it as the range -- gaseous mixture -- the gaseous mixture from a supply port -- while raising the jet rate of flow and promoting evaporation and atomization, stratification-ization can be performed good.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view of the engine equipped with the suction system by one example of this invention.

[Drawing 2] It is the ** type top view showing arrangement of each port in the above-mentioned engine etc.

[Drawing 3] It is drawing showing the closing motion timing of the inlet valve in the above-mentioned engine, and a pin center,large valve.

[Drawing 4] the combustion chamber internal pressure in the above-mentioned engine, and gaseous mixture -- it is the graph which shows supply-port internal pressure.

[Drawing 5] It is the graph which shows relation with the combustion period to an air-fuel ratio, mean-effective-pressure fluctuation, and 90% of mass combustion rates.

[Drawing 6] It is the graph which shows the relation between an air-fuel ratio, and specific fuel consumption, HC discharge and an NOx discharge.

[Drawing 7] It is the sectional view of the engine in which another example of this invention is shown.

[Drawing 8] It is drawing showing the closing motion timing of the exhaust valve in the case of being based on the example shown in drawing 7 , an inlet valve, and a pin center,large valve.
[Description of Notations]
10 Engine
14 Combustion Chamber
15 16 Suction port
17 Exhaust Air Port
18 Inlet Valve
19 Exhaust Valve
20 Ignition Plug
23 Swirl Control Valve
25 Gaseous Mixture -- Supply Port
27 Pin Center,large Valve
31, 32, 51, 52 Cam shaft
60 Valve Timing Adjustable Means